AMERICAN HOROLOGIST

THE AMERICAN HOROLOGIST

Official National Publication of the United Horological Association of America, Inc., and Its Affiliates

Published under the direction of the U. H. A. of A., Inc., Executive and Technical Boards by the Roberts Publishing Co.

To inculcate the principles of the U. H. A. of A., fraternal and commercial advancement; to promote the welfare and enhance the betterment of its members; to cultivate good fellowship and a higher degree of knowledge in Horology; to be sent free monthly to all members. National membership, $2.00 per year. Make application to nearest secretary or representative. Addresses can be secured in the NATIONAL AND LOCAL INFORMATION column in this issue.

Address all communications to THE AMERICAN HOROLOGIST, 3226 East Colfax Avenue, Denver, Colorado.

Editor

ORVILLE R. HAGANS
Denver, Colorado

Associate Editors

FRANK FOEGLER
Cincinnati, Ohio

THOMAS J. FAGAN
Boston, Mass.

OTTO R. SABRO
Portland, Oregon

Technical Editor

W. H. SAMELIUS
Director Elgin Watchmakers' College.

Assistants

ENTIRE TECHNICAL BOARD

All contributions and advertising material must be received not later than the 20th of the month. Advertising rates upon request.

Nothing that appears in THE AMERICAN HOROLOGIST may be reprinted without special permission.

Copyrighted 1936 by Orville R. Hagans.

Contents

	Page
A Memorable Anniversary, by Frank Foegler	5
Our Appreciation, Editor	7
1936 Advertisers	7
Manufacture of Jewel Bearings, by Paul Grodzinski	8
The Manufatcure of Watches, by Lloyd P. Dooley	10
Official Notice to Affiliates, Executive Secretary	12
Guide Your Polishing Slip, by Jos. A. Biemel	13
Hamilton Employees Get Bonus and Wage Increase	14
Special Notice to Members	14
Cincinnati Guild, by R. J. Flaxmayer	15
Dayton Guild, by R. E. Fisher	15
Election of National Officers	15
Replacing a Guard Pin, by S. P. Dayton	18
Setting Pallet Stones, by D. L. Thompson	19
Horological Assn. of Nebraska, by Morris Yost	20
Elgin Springs Last Minute Surprise	21
A Handy Filing Block, by N. C. Nielsen	22
Do You Know? By W. H. Samelius	23
Helpful Books for Horologist	29
National Affiliates	31
National Convention	Outside Back Cover

A Very

Merry Christmas

• • •

A Happy

and Prosperous

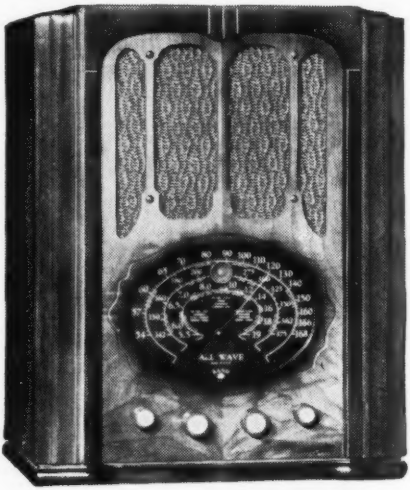
1937

SWARTCHILD & COMPANY

World's Largest Watchmakers' and Jewelers' Supply House

CHICAGO • NEW YORK • DALLAS • ATLANTA • BOSTON

Step Ahead with PAULSON



Size 13¾x18x10", shipping weight, 29 lbs.

1st **BUILD SALES AND PROFITS** with the Paulson-Simplex 1937 radio. All R. C. A. licensed with national advertising in famous magazines. Join up. REGISTER NOW.

PAULSON SIMPLEX

2nd **BUILD MORE SALES** with the Style Ship Catalog. Two full pages of Paulson Radios at retail prices in this Catalog. In this Style Ship recently mailed, you will find many of the hottest sellers today. Order these books now. Sell from them, with increased business and profits.

Paulson 11-Tube Table Model

One of the several big sellers shown in the style ship catalog. All priced in with your retail prices.

The above model uses 11 tubes as follows: 1/6K7, 1/6A8, 1/6D6, 1/75, 1/80, 3/76, 2/6B5, and 1/6N5. Also includes a high grade A. V. C. 8" Dynamic speaker.

Tone control. Output, 18 watts; power consumption, 75 watts.

No. G3572 Paulson 11 tube All Waves Super Heterodyne including R. C. A. tubes, ready to use. SPECIAL..... **$49.95**

No. G3581. Same radio with 5 bands, 13 to 2,000 meters. SPECIAL..... **$52.95**

LESS 40% TO JEWELERS

Henry Paulson & Co.

37 So. Wabash Ave. Chicago

JOIN UP WITH US

REGISTER NOW

PAULSON SIMPLEX

SOLD ONLY THROUGH RETAIL JEWELERS

USE THIS HANDY COUPON

Henry Paulson & Co.

I am interested in your nationally advertised radio.

☐ Please register my name for the jeweler's discount of 40%.

☐ Style Ship catalogue and Voice of the Retail Jeweler recently mailed. If you did not receive your copies, put check in square and they will be mailed to you promptly.

Name .....

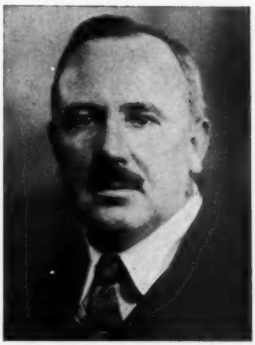
City .....

State .....

A. H. 11-36

A Memorable Anniversary

By Frank Foegler



January, 1936, is an outstanding month in the history of the Horological craft in the United States. In that month, a small booklet made its debut to the Horological world, and it was received with the greatest of enthusiasm, the sponsors having given it the most appropriate name, that of "The American Horologist."

Although only one year old, this infant journal has found its way to more than 5,000 shops, homes, institutes, and libraries in these United States and abroad.

The struggle preceding the publishing of "The American Horologist" was a hard one, antagonism, prejudice, hate and intolerance, have formed a combined front, to place all possible obstacles in the way of progress, to prevent the appearance of a noncommercial, purely informative and educational journal in the field of the Horological craft.

Criticism was expected. This is a natural course of progress, but it should come in a constructive form.

As we compile the twelve issues of the first volume, it is of interest to note that every article appearing in this volume is wholesome and clean from any expressions that may suggest even a trace of antagonism or intolerance towards other organizations, associations, or contemporaries, in other words, it is a journal in its best form, and we intend to follow this principle in the future, thereby assuring the growth of this infant journal.

I am wondering if the great mass of horological craftsmen recognize that "The American Horologist" is their journal, and will look upon it as the corner-stone of the structure that houses the monuments of the immortals of our profession, repeating and spreading their ideas and theories, so that we may all share in their knowledge and enable us to serve the public in an ethical and masterly manner.

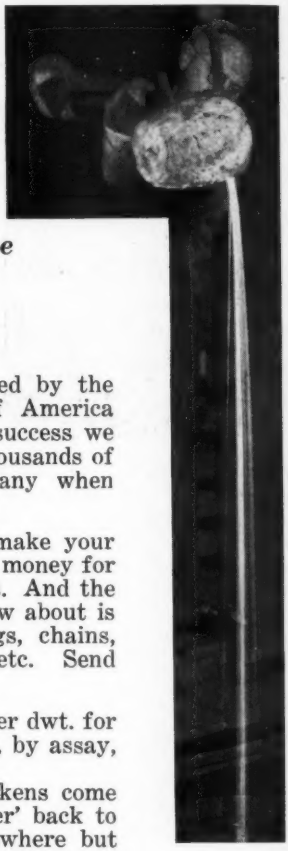
Craftsmen: the perpetuation of the life of this journal is in your hands. As you all know, its existence depends entirely on support received from sale of display space. It is your duty to convince your local jobber, wholesaler, manufacturer of watches and the importers and jobbers of foreign made materials for foreign made watches, that it is your wish that this journal be kept alive, point out to them that they will or are receiving the benefits of their courtesy, by your patronage.

And to you fellow craftsmen, I have this to say: For the continued prosperity of our craft and industry, patronize those concerns who make our work possible to enlighten and uplift our craft. Be loyal to your pledge to use the best of materials, to conduct your business ethically.

Keep our record clean and progressive. See that you are in good standing by having your dues paid up in January. Your dues are small, and are the only means whereby we can continue this work in your behalf.

After five years of serious business depression, prosperity is returning. Help us retain gaining prosperity by buying, selling and servicing the finest. Organization is more essential during prosperous times as it affords us the opportunity to perfect those things which will aid us during reverses and depressed times.

CHRISTMAS
★ GOLD ★
NOW POURING IN



And who could choose a better time to deal with us?

For ——

a. The scrap gold buying plan formed by the United Horological Association of America and ourselves has proved the big success we planned on. **Your** shipment, and thousands of others, are in the best of company when they're sent to us.

b. A Christmas check from us will make your Yuletide logs burn brighter. Extra money for Christmas is a necessity with folks. And the quickest, best extra money we know about is waiting for you in your old rings, chains, bracelets, filings, sweeps, etc., etc. Send them in.

c. Our prompt paying of 6¾c per k. per dwt. for the fine gold content of your scrap, by assay, is "tops" in the jewelry field.

A customer just writes: "Chickens come home to roost, so here is 'old-timer' back to you. We have been shipping elsewhere but **find we can get better results from Hoover & Strong."**

Your Experience Will Duplicate His. Send Us a Christmas Shipment Today — the U. H. A. A. Will Be Credited With It,— But First We Pay You Promptly and Fully.

HOOVER & STRONG, INC.

119 W. Tupper St., Buffalo, N. Y.

Est. 1912 *Refiners, Manufacturers of Standard Jewelers' Solders*

Our Appreciation

The close of this month, December, 1936, marks our first successful year of our paper, THE AMERICAN HOROLOGIST.

To our advertisers who have contributed so loyally to the maintenance of THE AMERICAN HOROLOGIST, and endorsed our Organization work of uplifting the craft, we extend our most sincere thanks and appreciation.

To those men who have unselfishly contributed the material appearing monthly, for the benefit of Horologists desiring to advance themselves and craft, we owe a debt of gratitude.

To our members, active and contributing, we extend our sincere appreciation for your continued support and interest in the welfare of all Horologists, which is the main aims of our many organizations and the U. H. A. A.

With the continued support and interest shown in the past twelve months, there is no doubt as to our ultimate success in bringing about better conditions and understanding among our craftsmen and the entire industry.

The personnel of UNITED HOROLOGICAL ASSOCIATION OF AMERICA, INC., and THE AMERICAN HOROLOGIST, extend our most hearty season's greetings and a wish for A MOST HAPPY AND PROSPEROUS NEW YEAR.

EXECUTIVE SECRETARY, *Editor.*

Advertisers Who Have Contributed to Our Publication During 1936

Bernard Italie, Inc.
Beckner-Heckman Co.
Buhl, Peer & Keefe
Bradley Polytechnic Inst.
B. & E. Company
Butterfield Bros.
Cosley Jewelry Co.
Consoli Brothers
Crohn, Sig
Correct Fit Crystal Co.
Dayton Guild
Daniel-Smith Co.
D'Arcy Oils
Dutcher Brothers
Elgin National Watch Co.
Elgin Watch College
Foote, B. L.
Fulcrum Oil Co.
Gemex Company
Germanow-Simon Mach. Co.
Gluck, Martin & Sons
Gruen Watch Company
Hadley Company, The
Halbert, Curtis G.
Hamilton Watch Company
Hammel, Riglander & Co., Inc.
Hansen, Jes I.
Henry, Peter & Son
Hoffman & Co., Inc.
Hoover & Strong, Inc.
Horological Assn. of Neb.
Hotel Sinton
Hug, Adolph A.
Keil-Hall Company
Lampert, M. J. & Sons, Inc.
Levenson, M. S.
Lieberman Brothers
L. & R. Manufacturing Co.
McCaw, Wm. S. Co., The
Marshall, C. & E. Co.
Malkin, P. M.
Master Lathe Light
Montana Assay Office
Myers, W. S.
Nat. Pictures Service, Inc.
Newall Mfg. Co., The
New Haven Clock Co.
New Haven, Conn. Guild
Noble, F. H. & Co.
Paulson, Henry & Co.
Queen City Watch Case Co.
Sauer, A. & Co.
Schenkein, Wm., Inc.
Schumer, E. & R., Inc.
Sculler, Earl Co.
Smith's Agate Shop
Steffes, H. T. Co.
Swartchild & Co.
Swigart, E. & J. Co.
"Timeology"
Waltham Watch Co.
"Watch & Clock Maker, The"
Watch-Motor Mainspring Co.

Manufacture of Jewel Bearings

By PAUL GRODZINSKI, Berlin, Germany

Courtesy, The Instrument Maker

Materials

IN precision manufacture, particularly in measuring devices and watches, the hardest natural and synthetic materials are used for bearings in order to obtain the greatest possible serviceability. The best properties are not obtained with metallic materials, but with materials of mineral origin and especially metal-carbides. In recent years it was possible to produce a series of new materials by electro-chemical processes, the properties of which are partly superior to natural products.

Materials, capable of withstanding the greatest demands upon them, should have the following characteristics:

(a) Extreme hardness (to scratching, to indentation)
(b) High resistance to abrasion
(c) Small friction
(d) No danger of corrosion, oxidation (rust), etc.

The hardness of material has hitherto not been uniformly explained and it will perhaps be very difficult to evolve a generally accepted unit for hardness testing. Therefore it appears to be expedient, not to speak in general of the hardness of a known material, but to add in each case the manner or method by which the hardness was measured for instance, by static or dynamic indentation of a ball, by scratching, etc. Hardness testing is further influenced by the choice of distinct materials or shapes used for the testing points. As we have no ideal hard material, it was necessary to use the hardest known, i.e., the diamond, for the testing of similar hard materials. It can be presumed that the hardness qualities of the diamond in relation to indentation and abrasion are superior to all those materials hitherto used industrially.

For general hardness testing the scratch hardness of Mohs is used (introduced about 1820). It prescribes that the material to be tested be subjected to a scratch by contact with a sharp point of another hard material. Naturally that material must be considered the harder which causes a clear and visible scratch on the surface of the other. As a consequence of numerous tests made according to this method Mohs evolved a hardness scale (Table 1), the correctness of which relating to the order of minerals has been repeatedly proved by scientists. However, this should not be given a quantitative value as has sometimes been done. In the course of years the scratch method was considerably improved by the introduction of diamond points of special forms, a uniform loading of the scratching point, exact microscopic measurement of the scratch-width or depth, etc.

Table 1. Mohs Hardness-scale

	Hardness Value	
Talc	1	can be scratched by finger nail
Gypsum or Rock Salt	2	
Calcite	3	
Fluorite	4	
Apatite	5	hardness of window-glass between 5 and 6
Orthoclase (Feldspar)	6	
Quartz	7	scratches glass
Topaz	8	scratches glass
Corundum (Sapphire, Ruby)	9	scratches glass, hardness corresponding to sintered carbides
Diamond	10	scratches glass

*Adapted by the author from a similar article which appeared in Feinechanik und Praezision.

Further, other methods of hardness testing have been evolved: the planing off of small chips (method of Pfaff), drilling with the tetrahedrical point of a split diamond (Jagger). The indentation hardness, although well established for metal-materials, is seldom used for the testing of mineral substances (for instance the absolute hardness value according to Auerbach), in spite of the fact that recent tests show valuable results. Prof. M. Schuler stated, as a result of his research on the compression strength of crystals (compression of a ball or ballpoint on a plate of the same material), that no differences between synthetic and natural sapphires exist. Whereas a diamond point with the same

rounding off can be subjected to the fourfold pressure of a sapphire-point before small cracks appeared (only visible with the microscope). Only after increasing the load sixfold did the point break off; on the other hand a sapphire sustained only 1/10 of this load.

In Table 2 the results of older and newer work relating to the hardness testing of materials are reproduced. We see that each method measures a different characteristic of the material.

Table 2. Comparison of hardness values Relative values of hardness (corundum—1000). Table according Landolt-Bornstein

	Mohs (about 1820)	Franz (1850)	Pfaff (1884)	Auerbach (1891-1896)	Rosival (1892)	Jagger (1897)
Gypsum	2	.....	14	12	0.3	0.04
Rock-Salt..	2	.....	20	20	2.0	.....
Calcite	3	13.5	23	80	5.6	0.26
Fluorite	4	54	56	96	6.4	0.75
Apatite	5	235	141	197	8.0	1.23
Adular	6	392	310	210	59	25
Quartz	7	667	390	268	175	40
Topaz	8	843	705	456	194	152
Corundum	9	1000	1000	1000	1000	1000
Diamond ..	10	.....	.....	2170	140,000	greater than 1000

Resistance to Abrasion

In nearly all practical instances hard materials are subjected to wear in service; in most cases it has not been ascertained, that a sufficient oil film is always present between the friction surfaces. Rosival was the first to undertake work to measure the resistance of abrasion (also frequently called abrasion hardness). A definite quantity of abrasive grain was placed between a steel disc and the material to be tested and was rubbed off until no further abrasive action could be found. His data are given in Tables 2 and 3. Recently abrasion tests have been made with a calibrated sand-blasting apparatus (according to Gary-Mackensen). Herewith a definite quantity (about 20 g. corresponding to .7 oz.) is blasted under a definite pressure against the surface to be tested. The reciprocal value of the eroded depth after a definite number of blasts, gives a measure of the abrasion hardness of this material compared with others. Usually window glass is used as comparison material.

Friction Coefficients

In precision bearings only a small amount of energy should be consumed. When reducing the diameter of the bearing (only possible with hard materials owing to the high pressure per unit of length and diameter), the friction moment is also reduced, if we assume a given constant value of the friction coefficient. The harder the material, the finer and denser the crystal structure and the finer and smoother it can be ground and polished. Unfortunately the data on the friction coefficients given in the literature are very incomplete, in particular no friction coefficients of polished diamond surfaces can be found. From its use in chronometers and precision measuring instruments it can be assumed, that the friction cofficient of a polished diamond surface is smaller than that of other materials.

Resistance to Chemicals

The resistance of the jewels to acids is well known. Metal parts, exposed to acids or only to air tend to corrode or oxidize.

Materials and Their Suitability

Diamond is crystalized carbon (C) and has the highest hardness and also the greatest resistance to abrasion of all known materials. It crystalizes isometric in the regular system. The frequently occurring diamond-octahedrons can be considered as having originated from two tetrahedrons. Due to its high price, the diamond can only be used for work requiring extreme bearing capacity or high abrasion resistance. The production of synthetic diamonds has not yet attained an economic basis.

Boron-Carbide was only produced in an industrially practicable form in 1930. It has the chemical formula B_4C and is melted in electric arc furnaces. It is now used as an abrasive and also as wear resisting material for sand-blast nozzles and similar purposes. As this material can be produced in great quantities, it appeared possible that it could also be used as bearing material. The hardness of boron-carbide is between that of the diamond and corundum.

(Continued on page 24)

The Manufacture of Watches

By Lloyd P. Dooley

CHAPTER I.

Editor's Note—This is the first of a series of articles on the manufacture of a watch as conducted in the factory of the Elgin National Watch Company. We wish to emphasize the fact that this is not an attempt at technical discussion of the making of a watch but is simply our desire to give our readers some idea of what goes on in the factory.

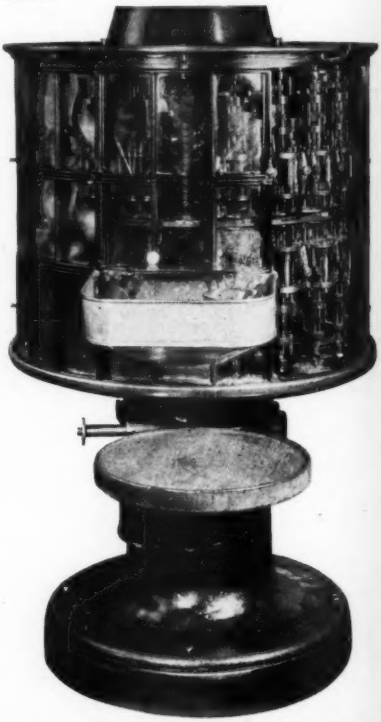
IT is particularly fitting that a series of articles on the manufacture of a watch should begin with a discussion of the work of the Plate department, for the plates form the foundation and framework of the watch.

Five plates are used in every watch—the pillar, or lower plate, which supplies the lower bearings for the train and escapement and which is the foundation upon which the watch is built; the barrel bridge, which covers the mainspring barrel and supports most of the stem work; the train bridge, which supplies the upper bearing for the train; the balance bridge which holds the jewels for the upper balance staff pivots, and the pallet bridge, which supplies the upper bearing for the pallet arbor.

In brief, the work of the Plate department consists of surfacing, or cutting all plates to the desired thickness; profiling, or smoothing the edges of the plates; recessing, or cutting away the plates to make clearances for the various wheels in the mechanism of the watch; drilling, tapping and counter-sinking the holes for the different screws and steady pins; setting the jewels, gauging the jewel holes and installing the jewels in the plates.

Plate blanks are purchased in the rough in the approximate shapes in which they are to be used. The first operation is that of facing or surfacing the plate to the proper thickness. The machines that do this work are very sensitive and accurate to a ten-thousandth of an inch. The work is gauged on dial gauges, which can measure down to .0001 of an inch.

One of the most important operations is that of punching the three work holes in the lower, or pillar plates. This is important because all other work done on the plates is located from these three holes. Every chuck and jig has steady pins which fit into these holes and hold the plates in exactly the proper position while the various operations are performed. These same holes are also used to hold the dial feet on the finished watch.



A marvelous machine with three times as many parts as a railroad locomotive. 15,000 parts! 300 gears! A phenomenal combination of tiny, continuously moving tools. This automatic plate drilling, tapping and counter-sinking machine cost $50,000 to construct after eight years of experimental work.

The screw and dowel pin holes are drilled in the plates by a machine capable of drilling fifty holes per minute.

The operator places the work in the machine and removes it when completed. The machine automatically selects the position and drill size and if the drill breaks, or does not reach the proper depth, the machine automatically stops. The recesses, or clearances for the watch train, are also cut by a machine which selects the position, diameter and depth with no direction from the operator. All recesses are cut in one continuous operation and the chips are carried away by vacuum. The small bridges are shaped and trimmed by dies in a punch press and the engraving is die-stamped.

After the various facing, drilling, recessing and press operations, the pieces are numbered; one pillar plate, barrel bridge, train bridge, balance bridge and pallet bridge having the same serial number.

The holes for the lower jewels are bored on a quill chuck which is accurate to .001 of an inch, and each hole is bored on an individual quill for that particular center. The screw holes are threaded one at a time, on a geared tapping machine which is so constructed that it cannot overfeed and strip the threads. The jewels, which have already been fitted into the wheels that are each assigned to a certain watch, are now burnished into the proper hole in the plate.

Dowel pins are then screwed into the bridges. These pins are made from wire and screwed in at one operation, being shaved to size and position. The bridges are fitted to the pillar plate by corresponding number, and while being held to position by the dowel pins, they are screwed down with service screws. The assembly is then turned to fit the case and the correct diameters and elevations are produced in one operation. The holes for the upper jewels are bored on a quill similar to the one used to bore the lower and the same locating holes are used.

In a seven jewel watch the upper pivot holes for the train wheels are drilled with a drill which is often as small as .004 of an inch in diameter. To locate these upper train centers from the same locating holes, and to assure them being in exact line with the lower centers, is the reason for numbering and fitting the bridges to the pillar plates.

After the bridges are removed from the pillar plate, the upper jewels that are assigned to the watch are fitted into holes bored in the bridges. The upper jewels are held in position by two small screws and the holes for these screws are threaded after the jewels are in position.

The drilling operations produce sharp, uneven edges and to overcome this the holes are countersunk or chamfered. Recessing, milling, and turning produce burrs which are cut away by hand.

Inspection at various stages of manufacture and of finished work is visual. Measuring and gauging is to .0001 of an inch, and after passing strict standards of inspection, the pieces are matched by number and the complete assemblies delivered to the Gilding department. In an early issue we will describe the work of that department.—The Watch Word.

WORLD'S STANDARD FOR OVER A CENTURY

GENUINE AMERICAN WATCH MATERIAL SOLD EXCLUSIVELY

450 SIZES

GENUINE SWISS WATCH MATERIAL SOLD EXCLUSIVELY

WITH FINISHED ENDS FOR ALL MODELS OF SWISS WATCHES ONLY
$2.50 DOZEN—$30.00 GROSS

Complete Stock of Jurgensen Main Springs with Unfinished Ends

Sole Agents BUHL, PEER & KEEFE 37 MAIDEN LANE NEW YORK CITY, N. Y.

Attention, National Affiliates
Official Notice of National Convention

To all affiliated guilds and state associations. You are hereby officially notified in accordance to National By Laws, Article IX, Section 2, that the next Convention will be held in Chicago, Ill., April 26, 27, 28, 1937.

You are hereby requested to forward to national headquarters, the correct name and address of your national trustee.

Executive Board Members' Annual Meeting, Sunday, April 26, 1937, in the Executive Secretary's offices, Congress Hotel, Chicago, Ill., at 1:30 p. m.. Second Executive Board Meeting, Wednesday, April 28, 1937, in Secretary's Offices, time to be announced later. All executives should arrange to be present.

In electing your delegates to National Convention, please elect an alternate for each regularly elected delegate. Official credential blanks will be supplied upon demand in quantity needed.

Your national trustee shall act as chairman of your delegates, in accordance to National By Laws, Article V. F.

Number of delegates eligible in accordance to By Laws, Article IV, Section 5, one delegate for every unit of 50 members or fractional part thereof. For further detailed information, refer to National By Laws or National Headquarters.

In all cases, the By Laws refer to paid up members.

Resolutions and Amendments

Resolutions and amendments to be presented, must be forwarded to National Office, 30 days previous to April 26, 1937. For more complete information on conventions and presentation of resolutions, refer to Article IX, Sections 7, 8, 9, 10, 11, 12, 13.

Article X should be carefully observed at this time.

ORVILLE R. HAGANS,
Executive Secretary.

Patronize Our Advertisers

We Do
FIVE things WELL

1—In-2-Sta Watch Crystals; and magnifying Rock, Flat Tops, as well as all special glass jobs.

2—Fine dial refinishing, new dials to order; and general dial work.

3—Authentic 14-karat, gold-filled bracelet watch crowns, platinum shell, solid gold and platinum.

4—Complete coverage for mainsprings, American and Swiss, featuring The Monnat Geneva Resilient Mainsprings.

5—A complete line of genuine imported English Watch Straps.

* * *

DUTCHER BROTHERS
Incorporated
10 West 47th Street
New York City

15th Anniversary
America's Leading Watch College

Hundreds of outstanding jewelers got their start in world-famous Elgin Watch College. Many graduates now own successful businesses. Others are skilled watchmakers. This institution is sponsored by the Elgin National Watch Company. Training includes regular shop work and instruction by Elgin master craftsmen. Limited number of openings now available for young men over 17 who wish to get into this highly paid field. Rare opportunity. Modest tuition. For full particulars address Dept. E-11.

ELGIN WATCH COLLEGE
E. L. Schmidt, Registrar Elgin, Illinois

Our work costs no more than ordinary work.

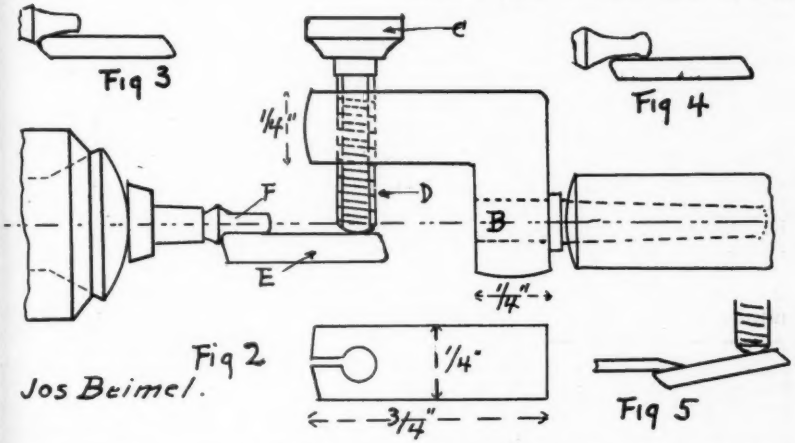
Incomparable Watch Case Repairing

BECKER-HECKMAN COMPANY
29 East Madison St. Chicago, Illinois

Guide Your Polishing Slip

BY JOS. A. BEIMEL

In taking watches apart for repairs and inspecting the balance pivots, one quite frequently notices that the pivots have actually been polished, but nevertheless are quite tapered or otherwise distorted. Grooves and unnecessary surfaces make their appearances when magnified; at times to such an extent that if one expects to properly poise the balance in order to get a fair position rating, it is far better to replace a new balance staff rather than try to patch up the old one.



Some workmen have pivot polishers but don't take the time to set them up for a polishing job; others again cling to the old habit of merely sharpening a piece of peg-wood, slapping a bit of diamonteen on this and rub away at the pivot with remarkable speed, actually rubbing or polishing grooves and surfaces into the balance pivot. Others again do not possess the steady hand they had while in their prime, and find it troublesome to keep the polishing slip parallel to the pivot to be polished.

To avoid the uncertainties of making a blotch job of a pivot, it will repay the workman to make in his spare time a little steadying tool which requires only a few seconds to set up for either grinding or polishing.

Refering to the figure, you will notice a balance staff held in the split chuck of an American lathe. A polishing slip is held by hand underneath the balance pivot F, and against the convex part of the set screw D. This set screw may be raised or lowered by turning the nut C, which is fast with the screw. The set screw fits snugly into the L shaped piece. Into this L shaped piece is driven or even soldered a taper shaft which is made to fit the tail stock of your lathe.

To make the tool is within the means of the average man at the bench. Merely select a piece of brass, iron or steel, about a quarter of an inch thick. Saw out with a circular saw or a jeweler's hand saw, the L shaped piece. Drill two holes in this one at B into which is driven your taper shaft which fits the tail stock of your lathe. The other hole is drilled to be tapped to fit the set screw D. Diameter of screw and threads per inch are optional. Though a large diameter screw with fine threads is preferred for firmness and more accurate adjustments. You may, after tapping saw a slit in the L shaped piece as in fig. 2. By pressing the two ends together, it gives the threads a closer fit so as not to turn loosely. It should not wobble or move while you grind or polish. The set

screw should be hardened at the convex tip which touches your grinding or polishing slip. You may even jewel this with a hard cap jewel.

By lowering your set screw you can alter the shape of a pivot as in fig. 3. By raising, you can adjust to remove a slight hump or a butted part without appreciably reducing the pivot in either case. In some cases you can adjust for grinding or polishing a small taper, see fig. 5.

To give the best results, your grinding and polishing slips should be about three inches long and about one-half inch wide. Boxwood and ivory for finer polishing. Iron and steel burnishers for hardening the shell around the balance pivot. For grinding iron and brass, slips will do.

I have found oil stone powder decanted best for grinding, and Sapharene ground in an agate mortar and then decanted makes a good polishing compound. One need not strictly adhere to the foregoing rules or methods. Some men prefer one method others again another. Nevertheless it is well to know more than one way of doing things, so that one can choose that which is better fitted to his personal requirements.

Lathes Repaired and Renickeling

Estimates Given—Will Loan You W. W. or Mosley Lathe While Repairs Are Being Made
Poising Saws and Screwdrivers
Special Tools and Tool Improvements Our Specialty

JES I. HANSEN
501 E. Second Ave. Denver, Colo.

Peter Henry & Son
Arthur P. Henry, Successor
Gold and Silver Refiners
ALSO
WATCH CASE REPAIRING
ESTABLISHED 1872
Room 610 Glenn Building
5th and Race Sts.
CINCINNATI, OHIO

1,650 Hamilton Watch Employees Get Bonus and Increased Wages

Directors Also Declare Sixteen Dollar Dividend on Cumulative Preferred 6% Stock, Wiping Out All Obligations

Directors of the Hamilton Watch Company met Thursday, November 12 and voted to give a bonus to 1,650 employees on December 1, and to increase wages 5 cents an hour or an equivalent amount beginning January 1.

The bonus will be a full week's pay for those employed a year or longer. Those who have worked less than a year will receive one-twelfth of a week's pay for each month of employment. Both the bonus and the wage increase are exclusive of Company executives and salesmen.

At the same time a dividend of $16 per share was declared on the cumulative preferred 6% stock, payable December 15 to stockholders of record November 24. This payment, plus $12 per share, paid previously this year, will wipe out all outstanding obligations on the cumulative preferred stock.

Special Notice to Members

Your 1937 dues should now be paid to your Local, State, or National Secretaries, in order to be assured of no interruption in the receipt of your paper, THE AMERICAN HOROLOGIST, and the many other features and services offered by your Guild, State and National Association.

National headquarters will not be responsible for lack of monthly contact and delivery of your paper, if dues are not paid in January.

All National Plaques will be withdrawn January 15, 1937, if your dues are not paid in full for the calendar year. Secretaries are notified to carry out this order without delay.

Cincinnati Guild

The Cincinnati Guild held their forty-second meeting November 6th, at Hotel Sinton; thirty-two members present.

Our educational work is proving very interesting and helpful.

January 16, 1937, our Guild will hold a dance. We expect to have a fine attendance, and are planning to receive considerable advertising from it.

We are pleased to announce that fine strides are being made to eliminate the work of the chiselers in our city. Great benefits have been received through our cooperative advertising in the Cincinnati papers.

R. J. FLAXMAYER,
Secretary Cincinnati Guild.

Dayton Guild

The Dayton Guild held their regular meeting Nov. 9th, at Van Cleve Hotel, which was well attended. The guest speaker was Dr. Koehler of U. of D., who spoke on gems.

R. E. FISHER.

Election of Officers

April 28, 1937, Chicago, Ill.

Officers elected for one year term, April 29, 1936:

President, Frank Foegler, Cincinnati, Ohio; Vice-President, Thomas J. Fagan, Boston, Mass.; Treasurer, Elmer Schneider, Toledo, Ohio.

Executive Board Members elected for two years, April 28, 1935:

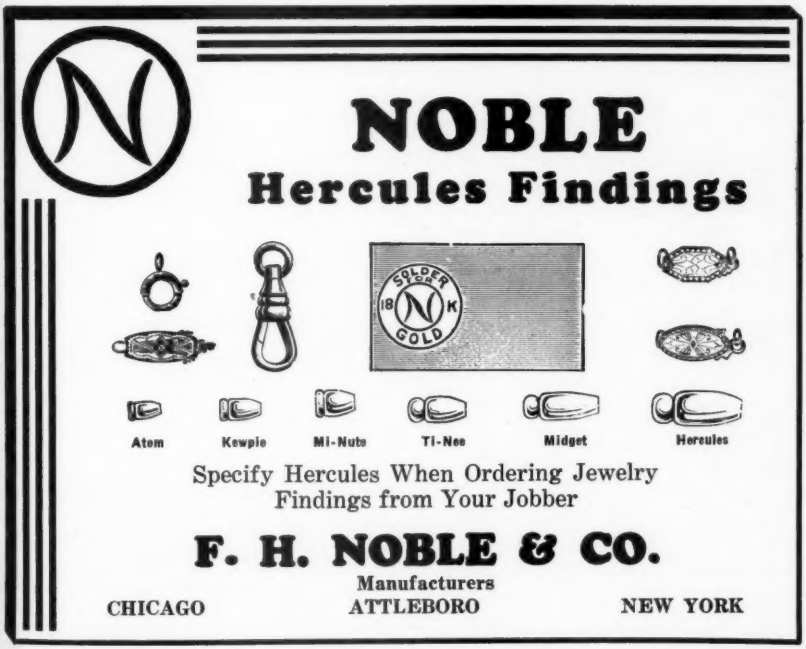
A. R. Raphael, New Haven, Conn.; L. W. Heimberger, Columbus, Ohio.

These offices will be subject to nominations:

President, one year; Vice-President, one year; Treasurer, one year. Two executives, three years each.

Patronize Our Advertisers

Secretary Will Accept 1937 Dues Now

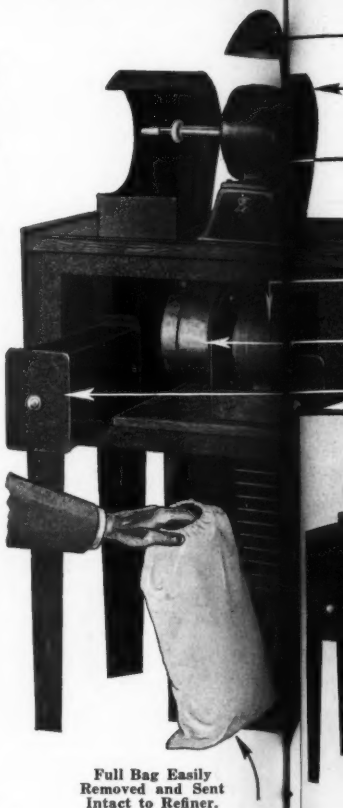


PEERLESS Polishing and Dusolle
SUCTION POWR

Entirely NEW Principle of Developing Suction Applied to DUST Collecting Outfits.

Far superior to anything heretofore on the market. The contour and funnel-like inside shape permits the powerful suction to whip **every bit of dust** below instantly. Each hood has a separate independent suction fan, running at full power, which provides maximum suction at both buffs at the same time.

It ought to sell for $200.00 if its value were based on the kind of job it does.



Full Bag Easily Removed and Sent Intact to Refiner. (New Bag 35c)

No. Y40104 DUST COLLECTOR—Complete with suction motor and also high grade 3450 R.P.M. Polishing Motor, mounted on a base with a heavy duty switch. Hig throughout; fully enclosed and dust-proof, oversize cast-bronze bearings, large du oil wells. Powerful, dependable, easy running and noiseless. Right and left tapered or 1 taper spindle and 1 arbor with drill chuck. For 110-volt, 60-cycle A.C. Shipping weight, 240 lbs.
Price, F.O.B. Chicago..... $9

$9.90 a Month for 10 Months

CHICAGO (2)
Box 7737

LOS ANGELES DETROIT
DALLAS NEW ORLEANS
MINNEAPOLIS

C. & E. MA
A GREATER VALU

AMERICA'S FOREMOST WATCHMA

...ollector
...R Unheard of Before

Built in Adjustable Lamp

Scientifically Constructed Hoods

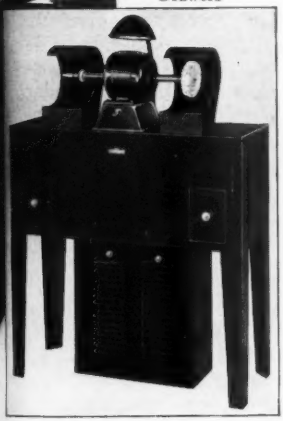
We Recommend Motor No. 39945

Rigid All Steel Construction

¼ H.P. Plus Fully Encl. Dustproof Motor

Separate Suction Fan For Each Hood

2 Convenient Lock-Stop Drawers



PRICED SO LOW

that No Jeweler or Repair Shop can afford to be without its conveniences.

—and BEST of ALL

It Pays For Itself!

PRICE $78.50

$7.85 a Month For 10 Months

No. Y40103 DUST COLLECTOR—Complete with motor for driving suction fans, cord and plug. For 110-volt, 60-cycle, A.C. Shipping weight, 200 lbs. For use with your present polishing motor. (Motor illustrated, not included.)

F. O. B. Chicago..... **$78.50**

...HALL CO.

...ALUE... GREATER SERVICE

CHICAGO (2)
Box 7737

MILWAUKEE HOUSTON
COLUMBUS PITTSBURGH
KANSAS CITY OKLAHOMA CITY

...HM... AND JEWELERS' SUPPLY HOUSE

Replacing a Guard Pin

BY S. P. DAYTON

S. P. Dayton

There are two classes of guard pins. One for the single and one for the double roller escapement, and the first question is, "What is a guard pin?" It's quite plain that it is to guard against something and that something is overbanking. It has always seemed to me that its importance to the proper working of the escapement should not be overlooked. A finely made and properly adjusted escapement will run without a guard pin until some jar or overwinding and an attempt to over-bank takes place, and with this in mind one should be careful in replacing it to do it so that it will not interfere in any way.

In the first place, an ordinary piece of pin wire is the material you will need, and assuming that it is a single roller escapement, place the wire in a pin vice and file down with the slightest taper possible and burnish it and then rivet it in the hole in the fork firmly, and cut it off long enough to reach just above the roller table. It should be bent forward as far as you want it to go at a point between the fork and the lower side of the roller table and then straight up to the end so that under all conditions of endshake of the fork or balance it will present the same straight line to roller table. It should be so adjusted that at no point in the locking and unlocking of the palates it will not touch the roller table, and only after the lock has taken place can it be jarred against the roller table to guard against attempts of banking and hence its name, Guard Pin.

In regard to the double roller, the process is partially the same except that the end is the point of contact with the roller table instead of the side and after riveting it in place, bend it at right angles forward to the lower roller table and cut it off too long so you can file it back wedge shape just long enough so it will pass through the crescent without touching it and then carefully burnish the end, which should be wide enough to prevent over-banking or passing above or below the roller table under any extreme of endshake. It can be set closer to the roller table than in the single roller, due to the reduced radius.

Here's How We Feel About You

If I knew you and you knew me,
'Tis seldom we would disagree;
But, never having yet clasped hands,
Both fail to understand
That each intends to do what's right,
And treat each other "honor bright."
How little to complain there'd be
If I knew you and you knew me.

—Selected.

WHAT DO YOU KNOW ABOUT WATCH AND CLOCK OILS?

A post card request will bring you without charge an extremely interesting and understandable booklet on

Watch Lubricants—Exposing Their Secrets—Explaining Their Use

Write for this booklet today—you'll learn things that will be valuable to you.

FULCRUM OIL COMPANY FRANKLIN, PA.

Setting Pallet Stones

By D. L. Thompson

THE workman is quite often called upon to replace chipped pallet stones and to reset loose ones. Genuine material should be used, if possible, in replacing these stones.

When replacing these stones, for any reason, it is well to check the entire escapement for proper adjustment. In doing this, begin with examining the balance, escape, and pallet arbor pivots to see that they are in perfect condition and fit their holes with a minimum of side play and end shake. The correct amount of side play is from .01 mm. to .015 mm. and the amount of end shake should be from .02 mm. to .05 mm. The next thing to check is the roller pin and fork slot action. Examine the fork slot closely and if found to be pitted by the roller pin it should be ground smooth with a thin grinding slip impregnated with fine diamond powder. Just a little of this will smooth it. The roller pin should fit the slot in the fork with from .01 mm. to .015 mm. play. A too close fitting pin will have difficulty in entering and leaving the slot easily while a too loose one will waste power that should be delivered to the balance. See that the roller pin is tight, perfectly upright, sighted in two directions across the roller table, and that it is exactly in line with the center of the passing crescent.

Being satisfied that the roller pin and fork are in proper condition the banking pins are now adjusted to the fork so that the roller pin will clear the corners of the slot by about .03 mm. in entering and leaving. The guard pin, or finger, is next to be attended to. The guard should be adjusted to clear the roller by about .02 mm. as .03 mm. has been allowed for the roller pin to properly clear the corner of the fork. This will give a safety leeway for the roller pin to clear the fork in case the guard is accidentally thrown against the roller edge, which may happen due to some sudden movement, or jar, overcoming the action of draw on the pallets. In adjusting the single form of guard the pin should in no case be left in a slanting position either towards or away from the roller edge but should be rather bowed in the middle towards the roller for the reasons that it will then present a curved and therefore smaller surface to the roller edge and this will diminish the drag on the roller, and the resultant

THE ARCH

You See It Every Place Where Strength Is Necessary

We Applied It to Mainsprings

Keep Step With Progress—Use

SANDSTEEL CROSSCURVED MAINSPRINGS

Best in the Long Run

Made in U. S. A. by

Watch-Motor Mainspring Co., Inc.

145 HUDSON ST. NEW YORK CITY

A Sure Source of Supply

Volume No. 1—The American Horologist

Popular request for a suitable binder for the twelve issues of your publication, **The American Horologist**, has been arranged for. The First Volume will be supplied in two bindings, Fabrikoid cover, which is a beautiful black imitation leather binding, bearing the publication's name in gold and your own name gold embossed on the cover, prepaid for $4.00.

Cloth cover, gold embossed with your name, prepaid for $3.50.

The first volume consists of 400 pages, over 230 illustrations. This book will be a welcome and useful addition to your library.

Those who will forward their 12 issues to THE AMERICAN HOROLOGIST, can secure a credit of $1.00 against the bound volume.

slowing down of the balance, if it should happen to come in contact, and, also, in the event that there is slightly unequal end shakes of the balance staff and pallet arbor, the guard pin to roller edge clearance will not be materially altered with the watch running in a vertical position where the relative positions of the guard pin and roller edge are likely to shift. For the double-roller form of guard, see that it is tight in the fork, central with the slot and in line with the center of the roller edge. The point of the pin should be chamferred off on both sides so that it presents only the extreme point to the roller edge and the point should be burnished to further reduce the possibility of drag in the event of contact between them.

Seeing that all of the above adjustments are correct simplifies, to some extent, the setting of the pallet stones in relation to the escape wheel. The stones are called the entrance and exit pallets. The entrance, or the stone that the escape wheel first contacts, in turning, has the shortest angle on the impulse face while the exit pallet has the greatest angle. They are often referred to as right and left pallets which is correct if the fork is viewed from the fork end. Each workman has his own particular names for these stones which enables him to quickly distinguish the one from the other. In setting the stones the fork is clamped, bottom side up so the stones will be level, on a pallet warming tool and the tool is warmed in a flame just sufficiently to soften the shellac so that the stones may be shifted. One at a time should now be adjusted so that the lock, including the slide, will be about one-fifth of the thickness of the pallet. Check this on each tooth of the escape wheel and on each pallet. In moving the stones a pivot broach may be inserted between the back of the slot and pallet to push them out but in setting them in hard steel, tools should never be used because of the great danger of chipping the fragile edge, use the peg for this purpose. Clean off all surplus cement with a short length of brass, or nickel, wire filed to a chisel face. Do not be tempted to use a steel instrument for removing cement as you are sure to have a scratched fork and chipped pallets. The shredded form of shellac is a very handy form to use as just the right amount can be deposited at the exact place desired.

Horological Association of Nebraska—Omaha Guild

Regular semi-monthly meeting was held November 20th, with an exceptionally fine attendance. Nomination of Officers for election in January was the important event of the meeting.

Mr. John J. Lacher, our present Recording Secretary, tendered his resignatiion, effective in January, which was accepted by the Chairman. Mr. Lacher is General State Secretary, and on the National Executive Board, and felt that this office should be held by some other member.

Mr. Markussen, of Henry Paulson & Co., due to his active service and efforts on behalf of the Guild, was voted an Honorary member.

First Amendment to Constitution, to change fiscal year from Feb. 1st, to Jan. 1st, was voted on and passed. This will somewhat simplify matters as it will start our year with the calendar.

MORRIS YOST,

DIAMONDS
MOUNTINGS
WEDDING RINGS

WM. SCHENKEIN, Inc.
449 STEEL BUILDING PHONE
DENVER, COLORADO MAin 7808

Elgin Springs Last Minute Surprise; Creates Big Stir in Trade

Introduces Distinguished New "Lord Elgin" Series in Time for Christmas

Bringing to a grand climax the parade of Elgin models introduced during 1936, The Elgin National Watch Company this month makes available to jewelers the outstanding "Lord Elgin" Series of 21 jewel wrist watches for men.

For many months, Elgin craftsmen and scientists have been directing their joint efforts toward the completion of this brilliant new series of timepieces. Only a short while ago it was not believed possible to have these watches ready for the market in time for this Christmas season. Many details of production remained to be solved. But by pushing the factory to the limit, the new watches began coming off the assembly benches early this month.

Designers had been instructed to create a style motif for the series in keeping with the "Lord Elgin" name, and in harmony with conservative taste. Dignity, therefore—expressed through simplicity of line and superb casing—is perhaps the most characteristic adjective that can be applied to the new models. At the same time, the ruggedness and sturdy masculine spirit typical of Elgin styling are given their fullest expression.

From the technical standpoint, the new "Lord Elgin" Series are distinguished by their 8/0 movements—the size growing fastest in popularity today. They contain all the exceptional advantages which have come to be associated with this size watch since Elgin first introduced it to America. They will run 45 hours on a single winding, for example. And the fine quality jewels are all friction set.

The price range of the new series is from $49.50 to $85.00—a most fortunate choosing of limits, jewelers agree. For this price class is high enough to appeal to buyers who wish to give the very best—yet low enough to be within the means of a large number of prospects.

With conditions improving consistently, and the outlook for a record-breaking Christmas growing brighter almost hourly, jewelers express the opinion that the new "Lord Elgins" are a particularly happy addition to their stocks at this time. As it is put by Howard Schaeffer, Vice-President of The Elgin National Watch Company, "We sincerely believe that the new 'Lord Elgins' will do more than their share in helping to make the coming holiday season one of the most prosperous the retail jewelry trade has enjoyed in many years."

L. & R. Announce New Improvements

The L. & R. special was recently announced with a new safety seal jar top, which is standard equipment on this model; also new heater element which enables rapid drying. Look for detailed description in the January issue of THE AMERICAN HOROLOGIST.

READING TIME: 104 YEARS!

Gigantic Proportions of Elgin National Advertising for December Revealed by Statistician's Figures!

When a born statistician wraps his fingers around a lead pencil and tackles a table of figures, the results are bound to be startling! And when the table of figures happens to relate to the Elgin Christmas Advertising Campaign in December alone, those results are doubly interesting to jewelers.

Jewelers know that Elgin is running a full page in full color in eight of the country's leading publications during the month of December. But it takes a statistician to discover the fact that if one man sat down to read each reproduction of this advertisement, he would have to keep his eyes constantly at work for exactly 104.7 years!

Jewelers who pick up the December 12th issue of the Saturday Evening Post will probably find it a heavy one. But its weight is but a drop in the bucket when compared to the 6,562 tons of paper which will be used to print the magazines carrying the Elgin Christmas Advertisement! More than 2,900 twin-motored transport airplanes of the latest freight type would be required to carry these magazines if all of them were marked "air mail." And if personal letters were written to each of the readers who are expected to see the Elgin Advertisement in December, the postage bill alone would amount to $1,651,359.36!

In paying his respects to that old favorite of all statistical comparisons, the famous "laid end-to-end" figure, the inquiring mathematician uncovered a particularly dramatic feature of the Elgin campaign. If all the reproductions of the Elgin December advertisement were placed "end-to-end" they would stretch for 2,593 miles, or almost exactly the crow-flight distance from New York to Los Angeles!

Not forgetting Elgin's spectacular "Football Revue," which brings Ed Thorgersen and Kay Kayser to the CBS microphone every Saturday night at 8:30 E.S.T., the statistician next determined just how many hours people will probably spend in listening to the show and reading Elgin magazine advertising during the current month. And this figure, his accurate pencil assures us, will amount to some 64,000,000 half-hours—or about 3700 years of one individual's time!

That novel Elgin mailing stunt—the "St. Nick" letters, came in for their share of the attention also. Pity the poor postman who might undertake to deliver all of these letters which have been ordered for mailing! Working 8 hours a day, and allowing himself 5 minutes in which to make each delivery, he would be kept busy for nearly 3 years—with **no** days off.

Time out for this next one! Here is the final figure—the one figure which perhaps more than any other gives an idea of the tremendous coverage attained by the Elgin campaign in December—an estimate of the number of times the name Elgin will be impressed on some individual during the month preceding Christmas. And this, our obliging statistician informs us, amounts to the staggering total of 3,656,317,184—or nearly 30 times for every man, woman and child in the United States!

Mention "The American Horologist"

A Handy Filing Block

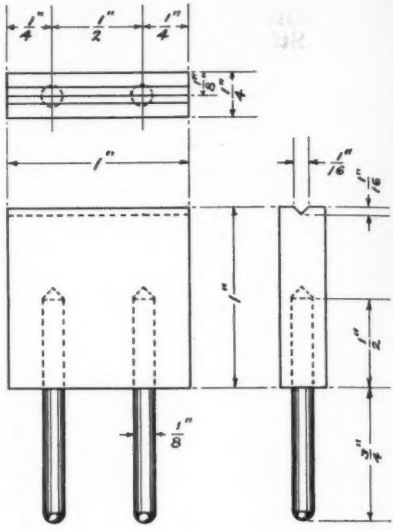
By N. C. NIELSEN

Illustrations By L. D. THOMPSON

A handy filing block that may be placed in position or removed in a moment is a useful adjunct to the bench.

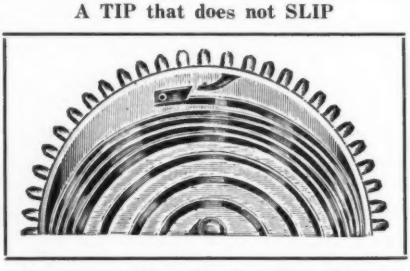
The block, here described, is easily constructed and consists of a piece of bakelite, of the dimensions shown in the drawing, which is drilled for two peg supports, as indicated, and two holes to match the pegs are then drilled in the front edge of the bench, just above the apron, which position is the handiest for proper light and ease of observation of the work.

This little block has been found to be very serviceable in light touch-up filing and burnishing. It is especially handy as a support for a fork when polishing the slot. Many other uses will be found where a non-metallic support for the work is desirable.



D.L.T.

A TIP that does not SLIP



Measurement Chart Sent Free Upon Request

The SECURITY MAINSPRING

uses this new non-slipping beveled edge tip exclusively. It ALWAYS engages the barrel hook and never slips. No filing necessary on spring. You have always liked the Security Spring—with this new tip you will like it still better.

Order Them From Your Jobber

Imported Exclusively by

The Newall Mfg. Co.

29 East Madison Street Chicago, Ill.

OUR FALL LINES ARE COMPLETE

New lines have been added. Watch for our salesman who will call upon you soon.

HADLEY	OSTBY & BARTON	BLISS BROS.
RONSON	PLYMOUTH CLOCKS	BARROWS
SIMMONS	OLYMPIC WATCHES	MT. VERNON WATCHES

GENUINE AMERICAN AND SWISS WATCH MATERIAL
JEWELRY BOXES AND WINDOW DISPLAYS

New and More Complete Lines of Material for Your Convenience

All Orders Shipped Same Day As Received

COSLEY JEWELRY COMPANY

301 UNIVERSITY BUILDING DENVER, COLORADO

DO YOU KNOW?

Directed by
W. H. SAMELIUS, Chairman
Science of Horology and Technical Advisory Board

That no watch or clock oil should contain a particle of petroleum or mineral oil, petroleum or mineral oil will not stay "put," they have a tendency to creep away and evaporate. If mineral oil is mixed with animal, fish or vegetable oil, this creeping away and evaporation will inadequate lubrication, therefore, any use of petroleum or mineral oil will be detrimental to a proper watch or clock lubricant. (Courtesy D'arcy Oils.)

That in some of the finest watches, the lifting plane of the receiving pallet is convex and the discharge stone is concave. This is to equalize the power delivery.

The color on mainsprings does not denote their true temper. The spring is first hardened and drawn to spring temper, suitable to that particular grade of steel and more or less a secret. The spring is then polished and recolored to a yellow or straw color, each manufacturer maintaining a color of their own, or we might say, trademark. Coloring the mainspring the second time makes the surface less susceptible to rust.

The Celpsydra, or water clock, was the first day and night, or continuous twenty-four hour timepiece of the ancients.

The hour glass and sun dial came from Asia.

That Charles Moseley was the inventor of our lathe chucks as we have them today. It was patented about 1868.

That the first weight driven striking mechanism is credited to Gerbert, gaining for him such great reputation that shortly afterward, he was made Pope Sylvester II, about the year 1000 A.D.

In the Metropolitan Museum of Art in Central Park, New York, there is on display, the famous J. P. Morgan collection of timepieces. Among them there is a timepiece which was so large that it was erected outside of the building. It is none other than the Obelisk which the Khedive of Egypt presented to the City of New York in 1877. The obelisk has served its purpose in Egypt for centuries as the Gnomen, or hand, to indicate noon by the projection of its shadows on the ground, the shortest shadow occuring at high noon. This obelisk is included as one of the earliest timepieces in existence. From this obelisk the sun dials were later invented.

The best results are acquired when the balance makes 1¼ turns.

The teeth of a chronometer escape wheel should not be oiled.

The escape wheel of the chronometer escapement has two drops — when the tooth drops on the impulse jewel and wheel, the tooth leaves the impulse jewel and drops onto the locking jewel.

The chronometer balance is the most highly detached when compared to the balance in the lever escapement, cylinder or duplex.

In order to obtain isochronism, Berthout made his hairspring tapering in thickness from end to end, however, the difficulty of making them that way brought them into disuse.

Manufacture of Jewel Bearings

(Continued from page 9)

Silicon-Carbide (SiC) was first synthetically produced by Acheson in the electric arc and was considered by the inventor as a substitute for diamond dust as an abrasive. It is somewhat harder than corundum and is now used extensively as abrasive grain for grinding purposes. Corundum (Al_2O_3) is a hard mineral which crystallizes hexagonically. It is found in natural form as emery and in the form of jewels, as for instance the sapphire (blue) and the ruby (red). It was possible to produce small crystals in the electric arc. These are used extensively for industrial grinding purposes. Verneuil developed an ingenious method by which he produced enlarged crystals in the electric arc by artificial growth. Therefore larger crystals could be produced (synthetic corundum). Fig. 1 shows such an apparatus. From a hopper 2, filled with the raw material (argillaceous earth in powder form, partly mixed with various pigments) the substance falls owing to a shaking device and the pressure of oxygen gas blast, into a vertical burner, to which hydrogen gas under pressure is conducted by means of tube 5. To avoid the radiation of heat a muffle of fire clay is provided which has a small window of blue glass for observation and control of the growing stone.

The mixing of the gases is controlled by valves 6 and 7. An oxy-hydrogen flame is obtained with a temperature of

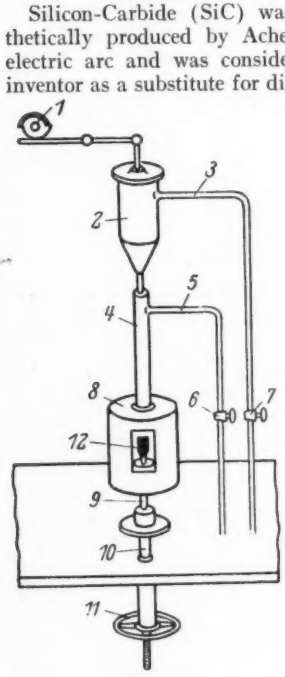


Fig. 1

Fig. 1. Production of synthetic jewels according to Verneuil.
1 shaking device
2 reservoir for argillaceous earth.
3 oxygen pipe line
4 burner
5 hydrogen pipe line
6-7 control valves
8 fire clay muffle
9 fire clay pin
10-11 adjustable table
12 window for observation of the growth of the molten pear.

Fig. 2. Muffle with white-hot melting pear.

Fig. 3. Complete melting drop in crystal form.

Fig. 2

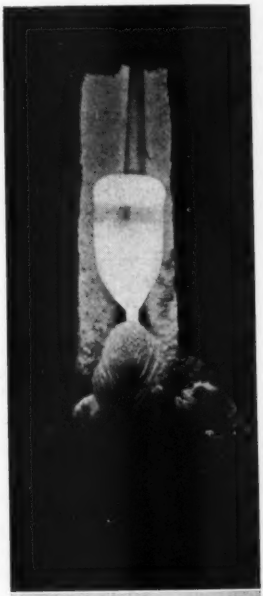


Fig. 3

about 2000° C., in which the argillaceous earth melts. The gas flame is directed at the fire clay pin 9, lying in the fire clay muffle 8. By careful control it must be observed that the nib of the pin is always in the hottest zone of the flame. The argillaceous earth, which is loosened by means of the shaking apparatus, falls down on the fire clay pin and is melted to tiny drops. By the control of the melting process it is made possible for the molten drops to increase more and more. Pear- and bottle-like bodies with stalk-like ends are hereby produced. The growing process is conducted in such a manner, that the stones are only connected with the fire clay layer by means of this thin stalk. They grow freely and can cool after completion, without the danger of bursting. Each molten pear (Fig. 3) forms a large uniform crystal of extreme hardness. A relation between the hardness value and the directions of crystallization as in the case with natural stones could not be observed. The hardest and most durable is the totally colorless synthetic sapphire. The largest crystals can be produced from this substance. Therefore it is preferred for bearings of various kinds. Any pigment acts as a foreign substance in the crystal construction and therefore somewhat reduces the quality.

The red ruby pigment only alters the suitability for technical purposes to a small degree, so far only small quantities of them have been applied. This color is for instance used for watch jewels. All other pigments: yellow, blue, green, etc., act in such a manner that the stones are useless for technical purposes.

The differences between the natural and the synthetic stones are that natural stones always have needle-like or cloudy inclusions (so-called Rutil-crystals of titanium oxide, Figs. 4 and 5). These irregularities, caused by the layer-like growth of crystals hinder uniform polishing. On the other hand the synthetic stone is clear and homogenous (Fig. 6). Table 3, compiled from older tests, shows a somewhat greater breaking strength of the synthetic stones, in contrast to the above mentioned more recent results of Prof. M. Shuler, which show an equal compression strength for both kinds. The friction coefficient is only half, the scratch hardness is considerably higher and also the resistance to abrasion should be greater. It is further reported, on tests in which 20 counters were equipped with natural sapphires and 20 counters with synthetic rubies as bearings that after 3 months use one observed that there were great differences

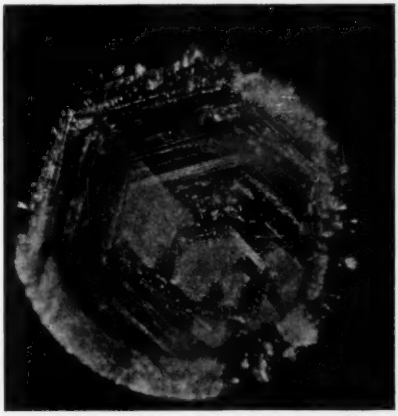


Fig. 4. Natural sapphire with zone-like structure, caused by the layer-form growth of natural crystals.

Fig. 5. Natural sapphire clouded.

in the abrasion of the natural stones, in some cases about 2 to 4 times that of the synthetic stones. Whereas in Europe almost 90% of the stones used are synthetic, in America natural stones (Montana sapphires) are used almost exclusively.

Fig. 6. Synthetic sapphire, totally homogeneous and clear.

DESIGN OF STONES AND BEARINGS

Kind of Bearings

In addition to plain bearings (trunnion bearings) pivot-bearings and knife-edge bearings are also used in the instrument industry. On these bearings the surfaces in contact and also the radius of the bearing are considerably reduced, thus the friction moment is diminished. On the other hand the bearing pressure per unit of length and diameter is increased far beyond the limit imposed for other purposes.

Trunnion Bearings

Trunnion bearings with jewels as bearings have been heretofore applied only on watches. These bearings are highly developed and due to mass-production are relatively cheap, therefore other branches of the instrument industry are in a position to use them more frequently than formerly. The trunnion bearings in watches consist of a plain drilled jewel (Lochstein) against which the trunnicn runs with its shoulder (Fig. 7) or a holed jewel runs against a cap stone (Deckstein) which takes up the axial thrust. The application of a separate cap stone therefore means an improvement, as both the radial and the axial thrust is carried by single jewels. For instance it is applied to the tunnion of the balance wheel in watches.

According to their purpose the drilled jewels are made in two forms, one with a plain cylindrical hole (Fig. 7), the other with an enlarged hole at both ends. Bearings with a plain cylindrical hole, only with a small chamfering on the side faces, are applied when the radial thrust predominates. However, they can also be applied for small axial loads, i.e., they can support the weight of a vertical shaft by means of its shoulder. The hole (Fig. 10), however, is destined only for bearings with the least frictional drag and only for small radial thrusts. Such a bearing is liable to damage by shock loads. The amount of axial load considerably increases the friction drag caused by the bearing surface. The stones described are further characterized by distinct cavities for holding lubricating oil. Many stones are further in drop-form, the fact being that these stones, especially

Table 3. Differences Between Natural and Synthetic Jewels

Material	Hardness according to Mohs	Abrasion resistance (Rosival)	Modulus of elasticity kg./cm.[2]	Friction coefficient	Breaking strength[2]	Scratch hardness[3]
Steel	6		2×10^6	0.1-0.15		
Agate	6	59	1×10^6			
Garnet	7	175		0.22	0.38	
Topaz	8	194				
Natural Ruby	9	1000		0.287	0.475	
Synthetic Ruby	9	1000		0.158	0.827	0.0055
Sapphire	9	1000	5×10^6	0.249	0.548	0.0069
Diamond	10	140,000	about 9×10^6[1]	?		up to 0.0138

[1] Calculated according to the compressibility (tests of Adams Williamson).
[2] Relative value according to tests of Chaponniere (Trincano).
[3] 25 g. load.

rubies, have a better appearance in this form and are more appreciated by the public. As the stones are now mounted by machinery one recognizes that these forms have no real value. On trunnion bearings with end stones, however, the curvature of the drilled stone is utilized for the better retention of the oil by means of capillary action. The oil film is indicated in black in the Figs. 8 and 9. For drilled stones natural and synthetic sapphires and rubies are used almost exclusively. The cap stones are applied in two shapes, as arched or as semi-arched stones (Fig. 8). In general the same materials are used as for drilled stones; however, for bearings of especially high quality diamond cap stones are also applied. They can withstand, as shown by tests, a considerable higher load than sapphires (Fig. 9). Table 4 gives data on the usual shapes and sizes of jewel bearings for watches. The diameter numbers are in relation to one tenth millimeter, the hole number to 1/100 mm. Therefore, a stone with a diameter No. 13 has an actual diameter of 13/10 mm., the hole number (No. 8) corresponds to an 8/100 mm. hole. The thickness of a stone is usually about one third of its outer diameter. Outer diameter and thickness are machined with a precision of 0.01 mm. whereas the hole has a precision of 0.0025 mm.

Table 4. Usual Sizes of Watch Jewels

	Outside Diameter No.	Hole Diameter No.	Price for 1000 Stones*
Glass—Garnet	7-20	8-17	8-12
(Spiegel-Granat, glace grenat)			
Glass—Ruby	7-20	8-17	10-14
(Spiegel-Rubin, glace rubis)			
Ruby for Balance	7-20	8-17	21-28
(Balancier-Rubin)			
Droplike Stone—Garnet	11-25	14-36	13-16
(Tropfenform. Stein, Goutte)			
Droplike-Stone—Ruby	11-25	14-36	21-28
Center-Stone—Garnet	15-30	50-100	30-38
(Zentrum-Stein)			
Center-Stone—Ruby	15-30	50-100	40-60
(Zentrum-Stein)			

*Price in Swiss francs for stones of first quality.

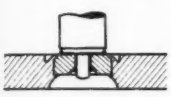


Fig. 7. Watch bearing with a pin and shoulder (holed stone).

Fig. 8. Watch bearing (holed stone and end stone).

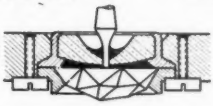


Fig. 9. Chronometer bearing with jewel holed stone and diamond cap stone.

Mounting of stones. The stones are inserted, as shown in Figs. 7 to 9, in a recess of the instrument body or in a special bearing holder, and a lip is spun over the edge of the stone. This process is now frequently carried out by machinery. To avoid a cracking of the stones when mounting, paper or leather washers are placed behind the stone in order to equalize and distribute the pressure more uniformly. Further the jewels are sometimes mounted in special aluminum or bronze bushings (Fig. 10), here a lip is also spun over the edge.

Pivot Bearings

Although (Fig. 11) theoretically the smallest possible friction drag exists in pivot bearings, the guidance of the shaft is not absolutely exact. When these bearings are used for horizontal shafts, the unavoidable axial back lash causes a small sinking of the shaft, whereby the friction moment becomes greater than the value calculated from the radius of curvature. If, however, vertical shafts are used, the axis of bearings and shafts fall together and the friction drag is very slight, the lower bearing serves as stop bearing, whereas the upper bearing may be somewhat offset. Therefore needle - neck - bearings (Nadel - Hals - Lager) are frequently applied for the upper bearing. Here a small pin (usually a piano-wire) is fixed in the frame of the instrument and guides the bear-

ing in the rotating shaft, for this purpose owing to the small size of shaft, jewels are rarely used.

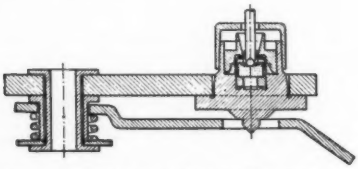


Fig. 12. Example of a pivot-bearing with a hardened ball.

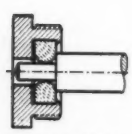


Fig. 10 (above). Holding box for a holed stone.

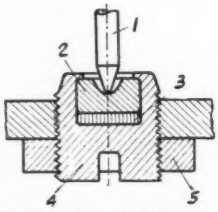


Fig. 11 (at right). Example of a pivot bearing. 1 pin 2 bearing stone 3 washer 4 bearing screw for adjustment 5 lock nut

The pivot-bearing consists of a hollowed-out body, usually a jewel, on which a round-nosed, tapered or cylindrical pivot runs. Sometimes a ball is also applied, mounted on a shaft or pin (Fig. 12), or a ball runs between two hollowed-out stones. Owing to the high pressure per unit, for both bearing and pivot point materials of high quality and extreme hardness must be chosen. The dimensions must be so calculated that the elastic limit of the material is not exceeded. According to an example in the work of Richter and von Voss the compression load in such bearings can be increased to about 500 kg./cm.^{2} (7110 lbs./in.^{2}) For the shaft points hardened steel (i.e. also in the form of hardened balls) is used, whereas the bearings consist of hard metal alloys or jewels. For bearings with a low friction moment agate is used; for electrical and other measuring instruments—rubies and sapphires, and for the highest demands—diamonds.

Usual sizes for the radius of curvature of pivot-bearings (Fig. 13) are as follows:

Radius of point r	Radius of bearing r
0.01-0.03 mm.	0.1-0.2 mm.
For fine instruments	
0.03-0.1 mm.	0.2-0.3 mm.
For larger instruments	

Fig. 14 shows cross-sections of some frequently used jewel bearings produced in large quantities.

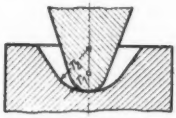


Fig. 13. Practical dimensions of points and bearings.

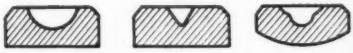


Fig. 14. Usual forms of pivot-bearings.

The bearings are frequently mounted in holders or bushings, having screw threads for fine adjusting and avoiding of backlash in the bearing (Fig. 11). By this also an easy and convenient exchange of pivots and bearings is made possible. Also here it will be found advisable to place a washer of elastic material under the jewel (compare Figs. 10 and 11). As the depth of the recess in most cases is only one-fifth of its radius of curvature, for the transport of instruments special locking devices are necessary; on pivot ball bearings as shown in Fig. 12, they can be dispensed with.

Research on pivot-bearings of electric meters, on which the pivots were of steel and the bearings of rubies, gave the following interesting results: After 1 million revolutions about 83% of the pivots and 57% of rubies became useless. A comparison test with diamond used as bearing with a radius of curvature r=0.35 mm. for the point and r= 3.7 mm. for the bearing showed that after 25,000,000 revolutions both the pivots and also the jewels had no sign of undue wear. Only after 30,000,000 revolutions, by the aid of a microscope could small signs of wear be observed.

Mention "The American Horologist" Prove Your Appreciation

Helpful Books for the Horologist

Send Orders to THE AMERICAN HOROLOGIST, 3226 E. Colfax Ave., Denver, Colo.

The Watchmaker's Handbook.

By Claudius Saunier. Translated from the French of Claudius Saunier, and enlarged by Julien Tripplin, F.R.A.S., and Edward Rigg, M.A. A workshop companion for those engaged in watchmaking and the allied mechanical arts. As an encyclopedia for the practical watchmaker and repairer this work stands paramount. Over 500 pages. New eighth edition. 14 folding plates. **Price, $5.00**

Horology—The Science of Time Measurement and the Construction of Clocks, Watches and Chronometers.

By Eric Haswell, F.P.H.I. This new book is one of the best yet produced on this subject. The author has explained the principles of operation and the constructional details of clocks, watches and chronometers. Appropriate historical facts are embodied when necessary.

The author discusses his subject in great technical detail. He has included calculation of a simple character for finding lengths of pendulums and numbers of wheels and pinions. Care has also been devoted to such essential details as the various forms of escapements, striking and chiming mechanisms, repeating and chronograph work, balances and springs, as well as electrical clock systems and marine chronometers. 267 pages. Illustrated. **Price reduced to $5.00**

Watch Repairing, Cleaning and Adjusting.

By F. J. Garrard. Covers the Cleaning and Repairing of Watches. Treats on the materials and tools used. Shows how to alter and adjust all kinds of English and Foreign Watches, Repeaters, Chronographs and Marine Chronometers. 214 pages. Ninth edition. Illustrated by over 200 engravings. **Price, $3.00**

Watch and Clock Makers' Manual.

By F. W. Britten. This book covers a large scope of practical repair work and embraces every type of watch from the early English Fusee to the modern wrist watch. This chapter alone makes the book a valuable addition to any library.

The use of the lathe and attachments is given thorough treatment. Methods of doing the usual jobs that come in the daily run of work, are also well described and illustrated.

The treatment of the hair spring is given considerable space, in a non-technical manner, with a description of forming breguet springs at the bench.

A section devoted to clocks is also included, and all known practical escapements are described in a manner easily grasped by the workman. 361 pages, 150 illustrations. **Price, $3.00**

The Junior Watchmaker.

By A. G. Thisell. Dealing with the lever escapement adjusting. **Price postpaid, $3.00**

Practical Balance and Hairspring Work.

By Walter J. Kleinlein. Beautifully bound in imitation Morocco, gilt edges, 115 pages, 43 illustrations. **Price postpaid, $3.50**

With the Watchmaker at the Bench.

By Donald DeCarle, F.B.H.I., for the practical watchmaker, 204 pages, illustrated. **Price postpaid, $2.25**

The Marine Chronometer—Its History and Development

By Lieut. Com. Rupert, T. Gould, R.N., F.R.G.S. The only book of its kind, over 300 pages, 40 full page photographs, and 85 drawings. **Price postpaid, $8.00**

The Lure of the Clock.

By D. W. Hering. Every bench man and store should possess this book. 121 pages, 99 beautiful illustrations. **Price postpaid, $4.00**

Rules and Practice for Adjusting Watches.

By Walter J. Kleinlein. Beautifully bound gilt edges, 108 pages well illustrated. **Price postpaid, $3.50**

Modern Methods in Watch Adjusting.

By Harold C. Kelly. Cloth bound, 126 pages and 13 illustrations. **Price postpaid, $2.65**

The Escapement and Train of American Watches.

By T. J. Wilkinson. Answers every escapement and train problem. **Price postpaid, $5.00**

Modern Watch Repairing and Adjusting.

By W. E. Borer. 120 pages, 121 illustrations essential for buyer, seller and repairer of all watches. **Price postpaid, $2.00**

Clockmaking—Past and Present.

By C. F. C. Gordon. With which is incorporated the more important portion of "Clocks, Watches, and Bells," by the late Lord Grimthorpe, relating to Turret Clocks and Gravity Escapements. By G. F. C. Gordon, M.A., A.M.I.C.E., Superintendent of Workshops of the Engineering Department of Cambridge University. A practical book of special interest to the Clockmaker, Repairer, Dealer and Collector, in which the author endeavors to cover topics which either have not been covered before, or which from his own experience require more attention than they have hitherto received. 232 pages. Fully illustrated by diagrams and plates of Long Case, Bracket and other Clocks, Dials, Hands, etc. **Price, $5.00**

Clock Repairing and Making.

By F. J. Garrard. Practical Watchmaker. Author of "Watch Repairing, Cleaning and Adjusting." A practical handbook dealing with Tools, Materials and Methods used in cleaning and repairing all kinds of English and Foreign Timepieces. 168 pages. Fifth Edition. Illustrated by 120 engravings. **Price, $3.00**

Modern Clocks, Their Repair and Maintenance.

By T. R. Robinson. All about the newest clocks for buyer and repairers. 120 pages, over 100 illustrations. **Price postpaid, $2.00**

Electrical Horology.

By H. R. Langman and A. Ball. A Practical Manual on the Application of the Principles and Practice of Electricity to Horological Instruments and Machines for the Measurement and Transmission of Time—With an Account of the Earliest Electrically-Driven Clock Mechanism. Recent developments in electric clocks. 200 pages. 93 illustrations. 1935 Revised Edition. **Price, $3.00**

Contents — Electro-Magnetically driven clocks, electrically controlled clocks, electrically wound clocks, electric secondary dials or impulse clocks, electrical striking gears, the synchronizing of electric and other clocks and miscellaneous electric clocks, recent developments in electric clocks. 200 pages. 93 illustrations. 1935 Revised Edition. **Price, $3.00**

Modern Electric Clocks.

By Stuart F. Philpott. An authoritative manual for clockmakers, describes every principle of construction, installation and upkeep. **Price postpaid, $2.25**

The Clock Book.

By Wallace Nutting. Descriptions of American and European antique clocks, list of their makers, etc., 312 pages, 251 illustrations. **Price postpaid, $1.80**

Modern Methods in Horology

By Grant Hood. A book of practical information for watchmakers. **Price postpaid, $2.50**

SPECIAL NOTICES

Payable in advance.

Rates under all headings except "Situations Wanted,"$1.50 for first 25 words. Additional words, 5c a word.

SITUATIONS WANTED, 75c for first 25 words. Additional words, 5c a word.

Heavy type, $2.50 for first 25 words. Additional words, 10c a word.

Name, address, initials and abbreviations count as words, and are charged for as part of the advertisement.

If answers are to be forwarded, postage must be enclosed.

Special notice forms close 30th of month.

Unless the advertiser instructs us to publish his name and address, all answers will be directed care THE AMERICAN HOROLOGIST.

SITUATION WANTED

Watchmaker—8 years' experience wishes employment in or around New York. Age 28, single, salary not less than $30.00 to start. Address Box A-11, The American Horologist.

Watchmaker—Long experience on all types of watches, now employed but wish change of location, am single, wish to locate in central West or West. Address Box A-12, The American Horologist.

Watchmaker—Young man wishes to be associated with someone who will further instruct in the finer arts of the craft, have had 5 years' experience, single, will start at $20.00 per week if advancement is possible. Address Box A-13, The American Horologist.

Watchmaker—15 years' experience, mostly railroad work, want to locate in Colorado, Kansas or Oklahoma, $35.00 or $40.00 to start. Address Box A-14, The American Horologist.

Wanted—Slide rest to fit W. W., must be in good condition and reasonable. Address Box A-15, The American Horologist.

HELP WANTED

The National Employment Bureau has numerous positions open for every type of workman. If desirous of making a change or securing a position, direct your mail, including qualifications, location and expected salary, to Employment Department, United Horological Association of America National Headquarters, 3226 East Colfax Ave., Denver, Colo

BLUEPRINTS

Working drawings for construction of wooden Columbus Clock consisting of a set of 15 blueprints for $3.25 postpaid. Address THE AMERICAN HOROLOGIST.

SLIDES

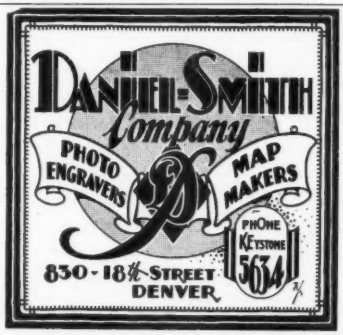
For advertising in theaters are now available in two designs, black and white at $1.00 each or in national colors at $1.50 each. These slides are built about our national, insignia creating public attention to honorable repair service.

Supplied to members only postpaid upon receipt of price. Address Advertising Department National Headquarters.

ADVERTISING MATERIAL

Send to Advertising Department National Headquarters for free samples showing prepared advertising material designed for newspaper, letter, cards and counter circulars, mats, plates, etc.

Mention "The American Horologist"
Patronize Our Advertisers



LOCAL JOBBERS' SECTION

THE WM. S. McCAW CO.
WATCH MATERIALS, TOOLS AND FINDINGS
315-317 Superior St. Toledo, Ohio

MARTIN GLUCK & SONS
Jewelers and Watchmakers Supplies
718 PENN AVENUE
PITTSBURGH, PA.

"The American Horologist" is made possible through the advertisers appearing in this publication. Through your patronage *you* can show your appreciation.

CONSOLI BROTHERS
Watchmakers and Jewelers Supplies
BRIDGEPORT AND NEW HAVEN, CONN.

For National and Local Information Contact the Following Organizations

Who function as a combined unit for the advancement of our craft. Membership at large represented in virtually every state.

UNITED HOROLOGICAL ASSOCIATION OF AMERICA, INC., NATIONAL HEADQUARTERS

3226 E. COLFAX AVE., DENVER, COLO.

ORVILLE R. HAGANS, Exec. Sec. **FRANK FOEGLER, Pres., 31 E. 4th St., Cincinnati, Ohio**

CALIFORNIA

R. D. Lowell, Special Rep., 612 E. 11th St., Oakland.

COLORADO

Master Watchmakers of, Inc.
Ernst Peterson, Pres., 1626 Welton St., Denver.
O. R. Hagans, Sec., 3226 E. Colfax Ave., Denver.

Denver Guild
D. E. Heigert, Sec., 1580 Logan.

Greeley Guild
Howard Weiss, Sec., 829 9th St.

La Junta Guild
M. L. Quackenbush, Sec., La Junta.

Boulder Guild
Fred Comstock, Sec., 1819 Pine.

Pueblo Guild
H. J. Affley, Pres., 926 W. 12th St.

CONNECTICUT HOROLOGICAL ASSOCIATION

New Haven Guild
Anthony Petrillo, State Pres., Waterbury.
Bernard Scanlon, State Secy., 18 Elmwood Ave., Waterbury.

Fairfield Watchmakers Guild
James Aspinwall, Pres.
Michael Enright, Secy., 2854 Fairfield Ave., Bridge.

New Haven Watchmakers Guild
A. H. Rosenbeck, Pres.
Wm. E. Short, Secy., 35 Springside Ave., Westville.

Waterbury Watchmakers Guild
Noel Phaneuf, Pres.
Bernard Scanlon, Secy., 18 Elmwood Ave.

Watchmakers Guild of New London
Sidney B. Mandell, Pres.
Morris Calmon, Secy., 48 State St.

FLORIDA

Greater Miami Watchmakers Guild
H. A. Andrews, Sec., 303 Second Ave., W. W.

Watchmakers Guild of Tampa
W. S. Nelson, Sec., 6014 Dexter Ave.

IDAHO

Chas. A. Braun, Special Rep., 434 State St., Weiser.

ILLINOIS

Joe Schwarz, Special Rep., 6646 Stony Island Ave.

Elgin, Illinois
W. H. Samelius, Special Rep., 267 Grove Ave.

Applications for membership can be secured from any representative of Henry Paulson Co.

INDIANA

L. R. Douglas, Special Rep., 1013 N. Beville Ave., Indianapolis.

Richmond Guild
H. L. Arkenberg, Secy., 20 S. 8th St.

KENTUCKY

Watchmakers Association of
S. H. Shaw, Pres., 305 Mid-West Bldg., Louisville.

Louisiana
Otho C. Formby, Special Rep., 1030 8th Alexandria.

Maryland
James A. Scoccini, Special Rep., 731 W. Fayette St., Baltimore.

MASSACHUSETTS HOROLOGICAL ASSOCIATION

John K. S. Mills, Pres., 313 Washington St., Boston.

Sam Freeman, Sec., 387 Washington St., Boston.

MICHIGAN

H. J. Finch, Special Rep., 15 E. 8th St., Holland.

Holland Guild
H. J. Finch, Secy.

MISSOURI

Master Watchmakers Association of
Walter I. Betts, Pres., 218 W. Maple, Independence.
Ernst Wetteroth, Sec., 10 Westport Rd., Kansas City.

Kansas City Guild
James W. Anderson, Pres., 4702 Broadway.
Ernest A. Thompson, Sec., 2119 Holly St.

MONTANA

Maurice Ethier, Special Rep., 113 W. Park St., Butte.

NEBRASKA, HOROLOGICAL ASSOCIATION OF

Geo. Rathbun, Pres., 107 Pearl St., Council Bluffs, Iowa.
John Lacher, Sec., 554 Brandeis Theatre Bldg., Omaha.

NEW ENGLAND STATES

Thomas J. Fagan, Special Rep., 617 Dextex Bldg., Boston, Mass.

NEW YORK

Buffalo, Watchmakers Association of
B. Paquette, Pres., 11 W. Genesse St.
K. A. Cooper, Sec., N. Y. Central Terminal.

Albany, New York
John De Vogel, Special Rep., 20 S. Pearl St.

Bronx, New York
Herman Cooper, Special Rep., 1698 Vyse Ave.

NORTH CAROLINA STATE HOROLOGICAL ASS'N
Lawrence G. Ballard, Sec., Box 595, Wilson.

OHIO WATCHMAKERS ASSOCIATION, INC.

W. H. Johnson, Pres., 3815 Grantley Rd., Toledo.

L. W. Heimberger, Secy., 245 S. High St., Columbus.

Cincinnati Guild
Frank Foegler, Pres., 31 E. 4th St., Cincinnati.
Walter L. Sturgis, Sec., 22 W. Elder St., Cincinnati.

Dayton Guild
M. C. Rife, Sec., R. R. No. 12, Box 274.

Columbus Guild
Lee E. Luce, Sec., 37 S. High St.

Toledo Guild
Ed. G. Schirner, Secy., 241 Huron St.

OKLAHOMA

Claude Jones, Special Rep., Box 884, Miami.

Oregon, Master Watchmakers of
R. E. Drews, Pres.
H. Sabro, Sec., 6422 S. E. 17th Ave., Portland.

PENNSYLVANIA, HOROLOGICAL ASSOCIATION OF

Geo. Niesslein, Pres., 200 Westinghouse Bldg., Pittsburgh.
J. P. Sommer, State Secy., 1524 Beaver Ave,. Pittsburgh.

PHILIPPINE ISLANDS

H. S. Cabugao, Sec., Dagupana, Pangasinan.

RHODE ISLAND

Hamilton E. Pease, Special Rep., 51 Empire St., Providence.

TEXAS

El Paso Horological Guild
C. P. Martin, 117 N. Stanton St.
R. L. Nordien, Sec., 3510 Louisville.

WASHINGTON

H. E. Anderson, Special Rep., 301 Joshua Green Bldg., Seattle.

Cowlitz Co. Watchmakers' Guild
Jay V. Carithers, Secy., 1265 Commerce Ave., Longview.

WISCONSIN WATCHMAKERS ASSOCIATION

Richard A. Meisner, Pres., 1839 Green St., Racine.

B. W. Heald, 339 N. 35th St., Milwaukee.

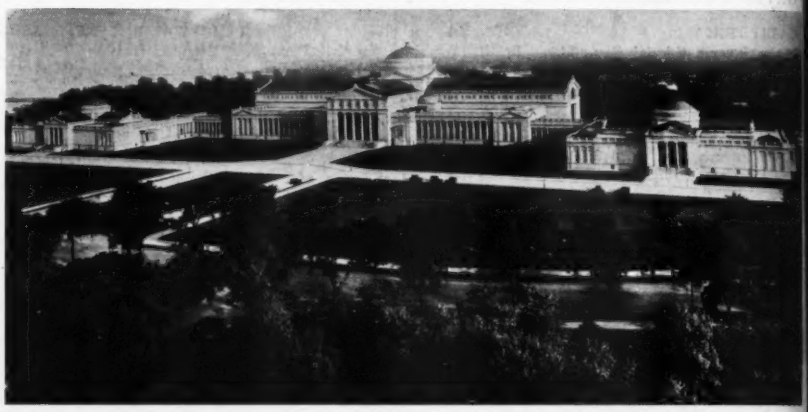
Milwaukee Guild
N. F. Ellenbecker, 4058 No. 23rd St.

Racine Guild
H. C. Jensen, Sec., 1648 Keanney Ave.

NATIONAL CONVENTION

United Horological Association of America, Inc.

CHICAGO, ILLINOIS, APRIL 26-27-28, 1937



Museum of Science and Industry, Housed in the Fine Arts Building of the Columbian Exposition. Here are graphically presented many of the important discoveries of science and their application to modern industry. One of Chicago points of interest.

Chicago today stands proudly on 210 square miles of happy, prosperous activity as fourth largest city of the universe, and recognized crossroads of America's population, industry, agriculture and transportation. The acknowledged host city of the Nation.

Plan your vacation for April and enjoy the many pleasurable trips of education, recreation and good fellowship to be had while The U. H. A. A. holds its third and largest Convention.

Florentine Room, Congress Hotel, where the watchmakers of America will discuss the welfare and advancement of our craft for the coming year.

Elgin Observatory

The Elgin Observatory was established in 1909 by the Elgin National Watch Company for the purpose of obtaining an accurate time service for use in the adjustment and regulation of Elgin watches. It is situated about two city blocks from the Elgin factory.